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MATHEMATICS AND ITS RELATION TO THE STUDY OF HOME-ECONOMICS IN THE UNIVERSITY ELEMENTARY SCHOOL

I. CAROLINE MAY PIERCE
Critic Teacher

There is no subject taught in elementary schools which is more liable to deaden the mental growth and retard the development of the reasoning powers of the child than arithmetic. Unless an evident need exists for using number in order to make a mental picture more vivid, or to make a distinct problem more definite, mathematics becomes a working with symbols which are mere symbols, instead of standing for real quantities—for problems that tend to a close and complete adjustment of means to some end.

Without going beyond the mental grasp of the pupils, the working at problems should command their best effort, although it is not necessary that each child should understand every problem which arises in the class, unless it will make his individual work of more intrinsic value.

Last year, in the seventh year of the University Elementary School, the work in beginning fractions was based almost entirely upon the children's work in cooking. In measuring materials for their grape jelly, cranberry sauce, brown bread, and other articles of food which they were preparing for the Colonial Luncheon to be given at Thanksgiving time, the need for the knowledge of halves, thirds, and fourths of their cups was supplemented by a necessity for learning the divisions of those parts, and combinations of different values.

At first, when working at his problems, each child held his measuring-cup in his hand; later many of the children represented upon paper or blackboard the operations to be performed, and some very quickly learned that the quantities could be represented by symbols alone, and referred to their measuring-cups only in cases of doubt, or in proof of work when the results had been challenged.

It is neither wise nor desirable that the measuring-cup should become a fixed and sole standard, and so it was displaced by the quart, peck, pint, foot, yard, and other standards.

This year the beginning work in fractions was also based upon cooking.

II. JENNY H. SNOW

Teacher of Home-Economics

The following article is written in response to a request that a definite illustration be given showing how mathematics is involved in the study of home-economics.

The papers are written by children of nine and ten years. The experimental work was done in the cooking laboratory; the mathematics, in connection with it, was carried out under the direction of the critic teacher, Miss Pierce.

The children were trying to find out how much sugar was needed to make jelly, and to solve the problem as to what difference it would make if varying amounts were used. They suggested that there might be a difference in the quality, amount, and cost of the jelly. The class as a whole seemed to think that the more sugar used, the greater would be the cost per glass of the jelly. The only way to decide this question was to ascertain the cost of each glass. Their papers show the amount of work necessary to do this, as well as the value of such a method in mathematics—a method which involves a problem the answer of which has a definite meaning to the children.

Following their papers is a summary of the work and its results.

SEVENTH SCHOOL YEAR

October 25, 1906

GRAPE JELLY

I

The last time we made grape jelly each child used ½ cup of grape juice and different amounts of sugar. I used ½ cup of sugar to ½ cup of juice and got 1½ wineglasses of jelly. The way I found out my cost was to find out that a basket of grapes cost 20 c., and the 14 children that went up to cooking used ¾ of a basket of grapes, which must have cost 15 c. There are 7 cups of grape juice in ¾ of a basket of grapes. $\frac{1}{7}$ of 15 is $2\frac{1}{7}$, so ½ cup would cost $1\frac{1}{14}$; and 1 lb. of sugar costs 5 c., and there are 2 cups of sugar in one pound. ½ of 5 c. is 2½ c., and ½ of 2½ c. is 1¼ c., and if you add them both together they make $2\frac{9}{28}$ c.

Alfred Rogers

II

In making grape jelly the question came up how much sugar to use. So we tried to find out by experiment.

To find out, each child used a different amount of sugar to half a cup of grape juice. I used 6 tablespoons to half a cup of grape juice and boiled it to 220° Fahrenheit. I got nearly one wineglassful of jelly.

¾ basket grapes cost	$0.15
Grape juice (14 people) cost	0.15
1 cup grape juice cost	$0.02\frac{1}{7}$
½ cup grape juice cost	$0.01\frac{1}{14}$
2 cups sugar in pound	
1 pound sugar cost	0.05
1 cup sugar cost	0.02½
6 tbsps. sugar cost	$0.00\frac{15}{16}$
16 tbsps. sugar in one cup	

$1\frac{1}{14} = \frac{8}{112}$

$\frac{15}{16} = \frac{105}{112}$

$1\frac{113}{112}$ or $2\frac{1}{112}$ cents cost of jelly

Moritz Loeb

III

Grape jelly can be made without sugar.

I made grape jelly with half as much sugar as juice.

We started out to make grape jelly, when someone asked whether it could be made without sugar.

We tried many different ways. Some of us made it without any sugar and some with $\frac{1}{4}$ as much sugar. All jellied.

I got $\frac{4}{5}$ wineglass of jelly, using $\frac{1}{2}$ cup of juice and $\frac{1}{4}$ of a cup of sugar.

One basket of grapes cost 20 c.

$\frac{3}{4}$ of a basket of grapes cost 15 c.; we used $\frac{3}{4}$ of a basket.

There were 14 children in the cooking class that day, and each one had $\frac{1}{2}$ cup of grape juice.

One cup of grape juice cost $2\frac{1}{7}$ c.

$\frac{1}{2}$ cup of grape juice cost $1\frac{1}{14}$ c.

In grape jelly there is the juice and sugar. The juice cost $1\frac{1}{14}$ c. The sugar cost $\frac{5}{8}$ c. The sugar and juice together cost $1\frac{39}{56}$ c.

Arline Falkenau

IV

Grape jelly can be made out of grape juice with different amounts of sugar. We started out to make grape jelly, and a question came up as to how much sugar we would use. I started out with $\frac{1}{2}$ cup of juice, and then I put in $\frac{1}{4}$ cup of sugar and let it boil to 105° C. When I had finished I had a wineglass full of jelly.

I used $\frac{1}{4}$ cup or 4 tablespoons of sugar and $\frac{1}{2}$ cup of juice. A basket of grapes cost 20c., and we used only $\frac{3}{4}$ of a basket, so that cost 15c. There were 14 girls and boys. And there are 7 cups of juice in $\frac{3}{4}$ basket, so one cup cost $\frac{1}{7}$ of 15c., or $2\frac{1}{7}$c., and $\frac{1}{2}$ cup would cost $\frac{1}{2}$ of $2\frac{1}{7}$c., or $1\frac{1}{14}$c. So the grape juice that I used cost $1\frac{1}{14}$c.

Sugar is 5c. a pound, and there are two cups in one pound. If sugar is 5c. a pound, a cup would cost $\frac{1}{2}$ of 5c. or $2\frac{1}{2}$c., and $\frac{1}{4}$ a cup would cost $1\frac{1}{4}$c. Both would cost $1\frac{1}{14}$c. and $1\frac{1}{4}$c., or $2\frac{9}{28}$c.

Mabel Chamberlain

V

One day we made some jelly. The question came up as to how much sugar we were going to use. I used $\frac{1}{2}$ cup of juice and $\frac{1}{4}$ cup of sugar. I boiled my jelly to 220° F. I had $\frac{4}{5}$ wineglass of jelly.

A whole basket of grapes costs 20 c. Three-fourths of a basket cost 15 c. There were only 14 of us, and we used a half cup each. My grape juice cost $1\frac{1}{14}$ c., because a whole cup cost $2\frac{1}{7}$c., and it would cost half of $2\frac{1}{7}$c., which is $1\frac{1}{14}$c.; and I used $\frac{1}{4}$ of a cup of sugar, which is 4 tablespoons full. My sugar cost $\frac{5}{8}$c., and my jelly cost $1\frac{39}{56}$ c.

ELIZABETH JOHNSON

VI

We wanted to find out how much jelly we would get using different amounts of sugar.

I used two tablespoons of sugar and boiled to 220° Fahrenheit.

I got $\frac{1}{2}$ wineglass of jelly.

One basket of grapes cost 20 c.

$\frac{3}{4}$ of a basket of grapes cost 15 c.

One-half cup of grape juice cost $1\frac{1}{4}$c. That is the amount of juice I used.

One cup of sugar cost $2\frac{1}{2}$c.

There are 16 tablespoons in one cup.

I used $\frac{1}{8}$ of a cup of sugar.

My sugar cost $\frac{5}{16}$ c.

My juice cost $1\frac{1}{14}$c.

My jelly cost $1\frac{43}{112}$c.

ROBERT LOVETT

VII

We started out with grape jelly.

Then the question came up whether we all used the same amount of sugar.

Some had $\frac{1}{2}$ cup of juice to $\frac{1}{2}$ cup of sugar.

I used $\frac{1}{2}$ cup of juice and no sugar. I boiled it to 220° Fahrenheit.

Then I took it off and let it cool, and then we studied out the different costs of our jelly.

I had $\frac{1}{4}$ of a wineglass of jelly.

One basket of grapes cost 20c. We used $\frac{3}{4}$ of a basket, which cost 15c. We had 14 people, and we used 7 cups. Each child had $\frac{1}{2}$ cup of grape juice. I had $\frac{1}{2}$ cup grape juice.

I did not use any sugar at all. My grape juice cost $1\frac{1}{14}$ cents.

BERNICE SCHMIDT

VIII

I started out to make grape jelly. I made my jelly without any sugar. I got my jelly, and I put it on to cook. I cooked it until 105° C. I had $\frac{1}{4}$ wineglass of jelly.

1 basket of grapes cost 20c.

$\frac{3}{4}$ of a basket cost 15c.

My jelly cost $1\frac{1}{14}$c.

I made grape jelly without any sugar. I had half a wineglass of jelly.

SAM GOSS, JR.

IX

If a pound of sugar cost 5c., a cup of sugar would cost $2\frac{1}{2}$c., and half a cup would cost $1\frac{1}{4}$c. We had one basket of grapes, and that cost 20c.; and we used $\frac{3}{4}$ of the basket; that cost 15c.; and for 14 people it cost 15c.; and so one cup of grape juice would cost $2\frac{1}{2}$c., and $\frac{1}{2}$ cup would cost $1\frac{1}{14}$c. If I did not use any sugar, my grape jelly would cost $1\frac{1}{14}$c.

HELEN GRISWOLD

SUMMARY

1 cup=16 tablespoons

Amount of Juice	Amount of Sugar	Number of Glasses of Jelly Obtained	Cost of Jelly
$\frac{1}{2}$ cup	8 tablespoons	$1\frac{1}{2}$ wineglass	$2\frac{9}{28}$ c.
$\frac{1}{2}$ "	6 "	1 "	$2\frac{1}{112}$ "
$\frac{1}{2}$ "	4 "	$\frac{4}{5}$ "	$1\frac{39}{56}$ "
$\frac{1}{2}$ "	2 "	$\frac{1}{2}$ "	$1\frac{43}{112}$ "
$\frac{1}{2}$ "	No sugar	$\frac{1}{4}$ "	$1\frac{1}{14}$ "

Much to the children's surprise, they found that the more sugar used, the cheaper the jelly per glass.